Chemical & Engineering NEWS
June 21, 1982

West Germany's ACHEMA is barometer of new chemical technology Page 26

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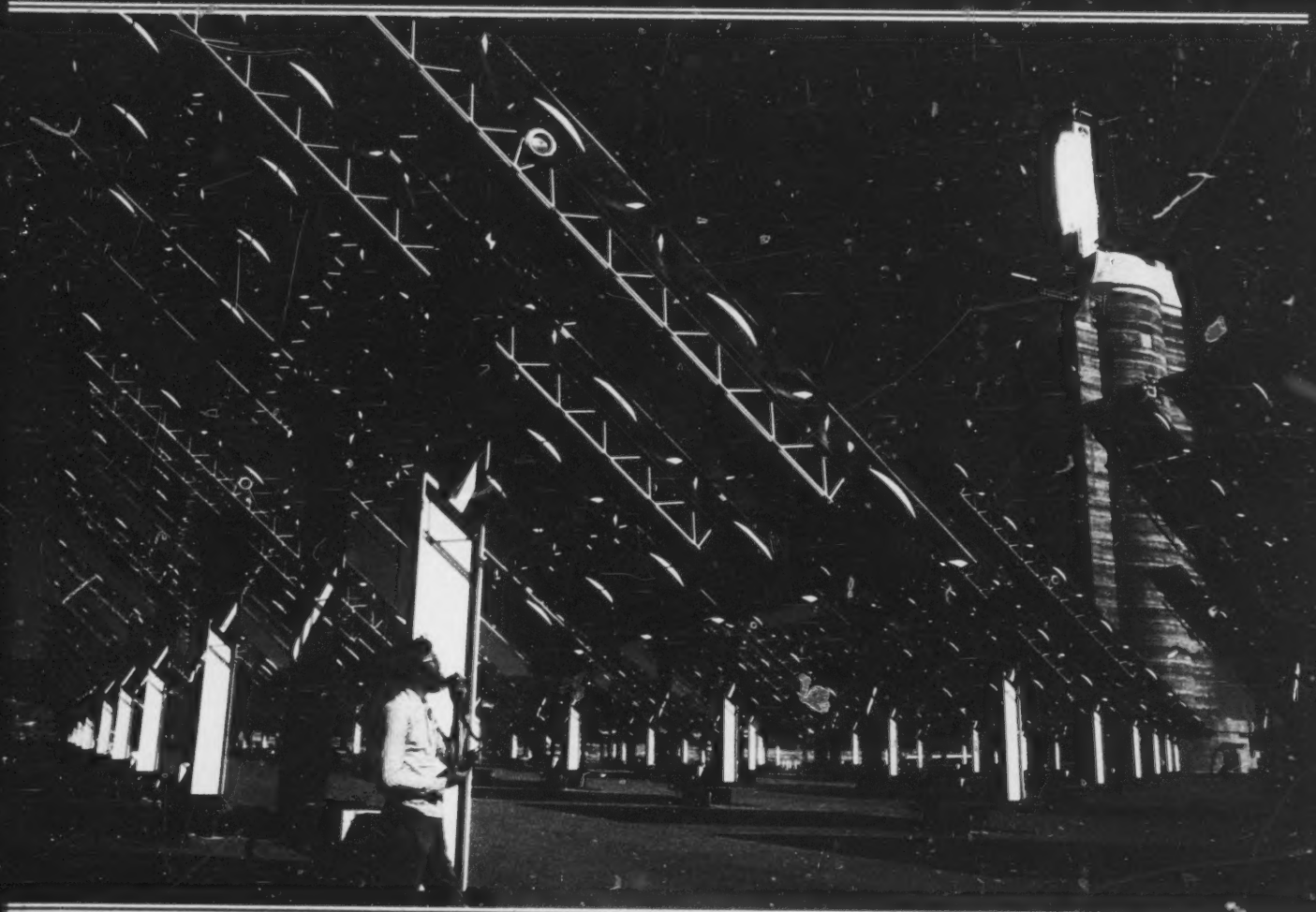

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Long-term research gains priority
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Chemical & Engineering NEWS

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Plastics monomers face third depressed year

Lower volumes and selling prices in 1982 for styrene, vinyl chloride, and toluene diisocyanate put severe profit squeeze on producers

Bruce F. Greek
C&EN, Houston

After 1981, could 1982 be any worse for plastics monomers such as the three major ones in the following pages—styrene, vinyl chloride, and toluene diisocyanate (TDI)? So far, the answer is yes. The prospects are for lower production in each, possibly lower average real selling prices, and little or no profit.

The problems faced by makers of these monomers reflect those of their users—lower demand and excess capacity in a long, stop-and-go recession. Forecasters seem to have given up predicting when demand will get back to its historic highs of 1979. Future demand for these monomers surely will take longer to regain those highs than all but the most pessimistic have thought.

Pessimism seems to pervade producers of these monomers just as it does most other major-volume organic chemicals. In fact, producers are hunkering down just trying to survive. Capacity expansions have been minimized, and substantial in-place capacity is shut down. Other efforts to economize take precedence under pressure of a cost-price squeeze, which led to large declines in net income for most chemical companies in 1981 and so far this year.

The economic slide can be seen clearly from the decline in commercial value of these monomers in 1982 from 1981. Because it has the largest volume of these three monomers, styrene could have the largest drop in value in 1982, possibly some $750 million or 25% from 1981. Vinyl chloride could be down more than 20%, or $300 million, in value this year. TDI's value will be off minimally, mainly because its production volume change is small. As a group, the three would have a total of some $3.6 billion in 1982, down 30% from 1981 and down about 10% from forecasts for 1982 made last year.

When the year's sales are totaled, the real commercial value could be a lot lower than expected because of recent and current discounting of list or posted prices. Some of these discounts take the form of formal "temporary voluntary allowances." Others may be sudden concessions to gain a sale. These discounted prices, if not increased during the rest of 1982, could pull down the total value another 10% for the year.

Key Chemicals

For example, during the second quarter most U.S. styrene sales were at prices 20 to 25% below list. Export sales were off another 10%. If a sixth of production of styrene is exported at a third off list price, and the rest valued at a fifth off for the year, the total value of production would be a bit over $1.8 billion in contrast to about $2.5 billion at list prices. Presumably, discounting will be reduced during the second half of 1982 as demand for styrene firms a bit.

Similar analyses can be made for vinyl chloride and TDI. In vinyl chloride's case, the discounting is formalized as temporary voluntary allowances. Both of these monomers sell at discounts of 20 to 25%.

In short, the value explosion in the 1970s, which gave these monomers some very good business years, is long gone. About the only remaining evidence of those heady days is the string of unneeded new plants resulting from visions in better times.

It was good while it lasted. Styrene's average merchant value per pound increased fivefold, from 6 cents to 30 cents, between 1972 and 1980, according to the International Trade Commission. And 30 cents is about where it remains today. Vinyl chloride's merchant value shot up almost as much, from 4 cents in 1972 to a peak of 19 cents in 1979. Since then, vinyl chloride's average value has eroded to about 15 cents.

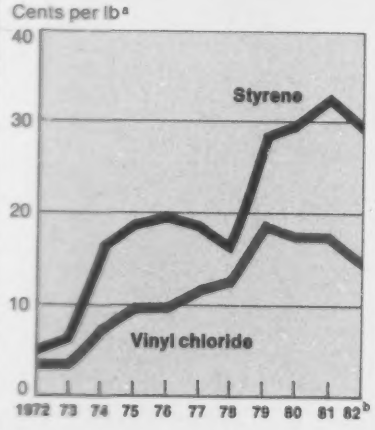
Not that producers haven't tried to push up prices. Styrene's list prices are 7.5 to 10 cents higher than the going rate, and vinyl chloride's posting is 7 cents higher.

Obviously, the question arises whether list prices are meaningful at all. A strong case for list prices can be made if all production costs are counted plus enough return on investment to justify new investment. Discounting has taken away the return and maybe some coverage of real production costs. Hence comes low profitability and the lack of capacity expansion.

Longer term, industry analysts feel that the seed corn is being eaten, so to speak. Capital expansion money will not be generated for capacity that will be needed in the mid-1980s and later. Prices then could go up and exports could decline. Imports, spurred by higher prices and capacity built in other countries, could surge in the latter part of this decade. But then prices could decline, and the U.S. industry would be no better off.

The monomers industry might even be worse off if it has to cut capacity. Investment money would then flow to other uses, away from low-valued commodity chemicals such as these that are several steps from more specialized consumer products.

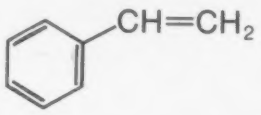
Major monomers' prices have sunk in the recession



a Average real-market values. b First half.
Sources: International Trade Commission; industry and C&EN estimates

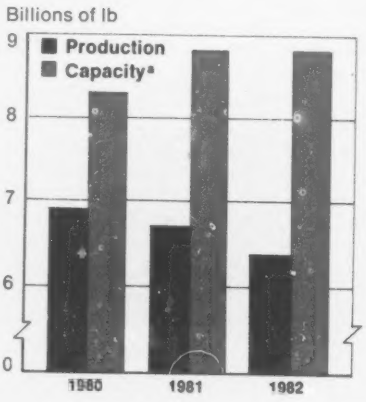
Key Chemicals

Styrene



- ***Demand down***
- ***Capacity flat***
- ***Prices discounted***

PRODUCTION/CAPACITY



[a] First quarter.

HOW MADE

Dehydrogenation of ethylbenzene obtained from ethylene and benzene or from petroleum reformate; coproduction with propylene oxide

MAJOR DERIVATIVES (U.S.)

Plastics-oriented polymers 80%, styrene-butadiene rubber 10%

MAJOR END USE (U.S.)

Fabricated plastics 90%

FOREIGN TRADE

Exports—easing to about 1 billion lb in 1982, imports—small

PRICES

List prices 37.5 to 40 cents a lb; discounting heavy, to 30 cents

COMMERCIAL VALUE

$2 billion for production, 1982

By the relative standards of this deep recession year, U.S. producers of styrene actually are better off than producers of many other organic chemicals. This despite a large amount of plant capacity temporarily shut down and severe discounting in selling prices.

Still, for 1982 a consensus puts styrene production at less than 6.5 billion lb. It could be as low as 6.2 billion lb. There are no optimists around who will even forecast a match of 1981 production of about 6.7 billion lb, which was itself down 3% from 6.9 billion lb in 1980.

If 1982 production reaches 6.5 billion lb, existing nameplate capacity for styrene would have run at an average rate of 74% for the year. That rate likely would be one of the higher ones in organic chemicals this year.

Admittedly, first-quarter production of styrene ran about 5.5 billion lb at an annualized rate, according to preliminary data from the International Trade Commission. In contrast, last year's annualized first-quarter rate was very close to the total reported for the year of 6.7 billion lb. Later in 1981, monthly production went up and then faltered in the fall and winter very much as did other organic chemicals.

A similar pattern of an upswing in styrene production this spring may have occurred even though considerable capacity is shut down. Currently, demand for styrene exceeds production, according to some in the industry. In other words, the inventory trimming begun in 1981 is continuing. Estimates of the remaining inventory and its direction vary from one analyst to another.

All inventory estimates hinge on the world economic outlook for the second half of 1982. If consumer demand improves significantly in the second half, then styrene production will have to increase rapidly to meet demand and rebuild inventories. One view is that a demand increase in durables markets, especially autos, would help styrene inventories more than an increase in demand in nondurables, mainly packaging uses.

Styrene exports for 1982 are expected to be about 1 billion lb, down a little from more than 1.1 billion lb in 1981. Analysts believe that inventory liquidation has gone disproportionately into exports. However, exports still could spurt 10 or 20% in 1982 because of low production of competing aromatics in Europe, where a lot of steam-cracking olefins capacity with aromatics coproducts has been shut down.

Neither such a business recovery nor a plateau followed by another downturn will have much effect on styrene's use patterns in the next year or so. Polymers, dominated by polystyrene, take almost all of styrene production. These polymers tend to gain volume slowly at the expense of other materials, especially in packaging. Here, expandable polystyrene seems to be most promising and accounts for much of the small expansion in polymerization facilities. Even so, after 1982, combined demand growth rates for styrene polymers may average only half or less that of their 5% annual rate of the 1970s.

Of the other polymers containing styrene, none are expected to change enough in volume to affect total styrene production. Styrene-butadiene-rubber (SBR) output, for example, could turn up significantly this fall if auto production rises. Although rubber production is languishing amid rumors of more SBR plant shutdowns, inventories of finished rubber appear low. To some analysts, this suggests a possible rush for styrene if tire demand rises suddenly. Even so, such a flurry wouldn't do much to help the overall styrene picture, since rubber accounts for just 10% of demand.

With no big new uses coming and reduced growth rates forecast for existing uses, styrene producers are taking a very conservative view toward plant expansion. Discounting in selling prices, somewhat offset by lower feedstock costs, also makes expansion very difficult to justify. So, other than debottlenecking and efficiency improvements, which usually add capacity, no expansion of styrene capacity will occur this year.

With a likely decline in styrene production in 1982 and no capacity expansion, producers will have to put 1982 down as a standstill. At best, efficiency efforts and shutdowns of excess capacity may let them make a little money.

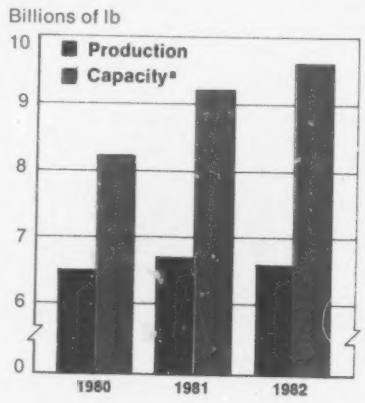
Key Chemicals

Vinyl chloride

$CH_2{=}{=}CHCl$

- ***Demand low***
- ***Capacity growth slowing***
- ***Prices forced down***

PRODUCTION/CAPACITY



* First quarter.

HOW MADE

Dehydrochlorination of ethylene dichloride made by reacting ethylene and chlorine

MAJOR DERIVATIVES (U.S.)

Vinyl polymers nearly 100%

MAJOR END USES (U.S.)

Fabricated vinyl plastic items nearly 100%

FOREIGN TRADE

Exports—may fall again to 700 million lb in 1982, imports—rising a bit to possibly 100 million lb in 1982

PRICES

List price 22 cents a lb with a 6-cent official discount

COMMERCIAL VALUE

$1.1 billion for production, 1982

As summer arrives and demand jumps for consumer vinyl products such as garden hose and beach toys, producers of the monomer, vinyl chloride, have achieved a price increase from around 14 cents a lb to 16 cents. But that still leaves tabs discounted far below the list price of 22 cents. Although producers really don't expect to sell more monomer this year, this price increase should be considered a real achievement if it lasts, for 1982 will go down as one of the poorest years ever for vinyl chloride.

Just how poor becomes clear from estimates of plant operating rates. If production comes close to matching 1981, say between 6.5 billion and 6.7 billion lb, then the available nameplate capacity will have run at less than 70% for the year.

To match 1981 production, 1982 will need a much better second half than the sorry clip of the first six months. Preliminary estimates of first-quarter production show an annualized rate of about 5.2 billion lb. Hence, the first-quarter operating rate was a horrendous 54% of the 9.6 billion lb of nameplate capacity. Obviously, considerable capacity was shut down. Although some shutdowns have been stretched out, production apparently improved in April and May, according to industry sources.

As with most other large-volume organic chemicals, production of vinyl chloride has picked up to more nearly reflect demand than it did in the fourth quarter of 1981 and the first quarter of 1982. Inventory liquidation pretty well has ended for the simple reason that inventories reached almost the minimum level needed to sustain smooth shipments.

For vinyl chloride, the more critical inventory is in its precursor, ethylene dichloride, since even in the best of times, inventories of vinyl chloride itself are kept very low. In 1981, part of the inventory problem was that raw-material chlorine producers, many of them also vinyl chloride and polyvinyl chloride producers, hunted for ways to get rid of it so they could sell more coproduct caustic soda, then in much stronger demand. The way out last summer was to build inventory of ethylene dichloride.

Sopping up that inventory during the winter badly hurt production of ethylene dichloride. Instead of using chlorine directly, vinyl chloride producers either hit their ethylene dichloride inventory or bought merchant ethylene chloride, cracked it, and used the coproduct hydrogen chloride via oxychlorination.

Now demand for caustic has weakened along with caustic's selling prices. And no longer is chlorine valued at practically nothing in the total picture of caustic-chlorine production. In effect, less low-cost chlorine along with interest costs that are still relatively high makes carrying a big inventory of ethylene dichloride less likely than a year ago. This trend seems to be one that will continue through the rest of 1982.

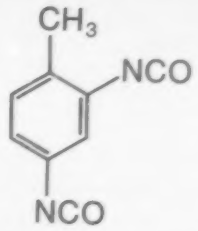
Although accounting schemes have a lot to do with determining costs and profit in vinyl chloride, higher chlorine costs and probable increases in raw-material ethylene costs this summer make the recent price increases for vinyl chloride necessary if producers expect to stay in business. Up to now, ethylene prices, which declined largely to about 18 cents a lb with some as low as 17 to 17.5 cents, certainly helped vinyl chloride producers make it through the winter, when vinyl chloride touched bottom at 14 cents a lb or less.

But about all that can be said for the present profit situation is that the near-term outlook is break-even. The large overcapacity in vinyl chloride plants will keep downward pressure on prices for a long time. Until the economy improves, none of the many uses of polyvinyl chloride will gain volume significantly. The big construction outlets, such as in pipe and fittings, might turn up a bit before the overall construction market does, but this alone will not be enough this far into the year to do much for overall monomer production.

A continuing slide in vinyl chloride exports, coupled with modest increases in imports, means that the U.S. market will in effect have to consume more of total production. This will be one more damper on vinyl chloride output in a year when producers scarcely need it.

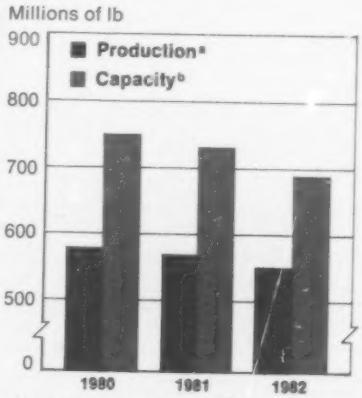
Key Chemicals

Toluene diisocyanate



- ***Demand slipping***
- ***Capacity cut back***
- ***Prices soft***

PRODUCTION/CAPACITY



a Mainly 80/20% mixtures of 2,4- and 2,6-isomers, but includes some 65/35% mixtures.
b First quarter.

HOW MADE

Nitration of toluene, followed by reduction to diamine, reaction with phosgene, purification, and recovery of coproduct hydrochloric acid

MAJOR DERIVATIVES (U.S.)

Polyurethanes almost 100%

MAJOR END USES (U.S.)

Flexible polyurethane foams 90%, polyurethane coatings 5%

FOREIGN TRADE

Exports—falling under 150 million lb in 1982, imports—negligible

PRICES

List price 93 cents a lb, some discounting

COMMERCIAL VALUE

$500 million for production, 1982

U.S. producers of toluene diisocyanate (TDI) would like to think that their production is pulling out of a severe slump from late 1981. Some feel that TDI might exceed 1981 production of 570 million lb. Others think 1982 production will be off a bit to about 540 million to 550 million lb.

Of course, all opinions are prefaced on the outlook for TDI's big markets in housing—both new construction and sales of existing houses—and in autos. It will be the second half that tells the tale for the year. In the first quarter, TDI production was down about 6% from first-quarter 1981. Such a decline for a large-volume organic chemical with a relatively high selling price must be considered as doing fairly well during the current severe recession.

This is not to say that TDI doesn't have problems. If production does decline for all of 1982, it will mark the third year in a row on a gentle downward slope. During this time, selling prices haven't done much more than barely cover costs. Sometimes prices couldn't even do that.

The result of declining production and little, if any, profit has been no plant capacity expansion since 1980, when BASF Wyandotte did a large debottlenecking project.

In fact, total capacity has declined. Early in 1980, Du Pont completed its exit from the business. Then in the fourth quarter of 1981, Olin closed its 40 million lb-per-year plant in Ashtabula, Ohio.

Estimates vary on nameplate capacity for TDI and even more as to actual operable capacity, because corrosion and other problems have been notorious in limiting output. Assuming that nameplate capacity as 1982 opened was about 690 million lb per year and that production declines for the year to 550 million lb, the plant operating rate for TDI will average 80% for the year. This rate, according to some industry sources, will be not too far below the maximum effective rate, which they put between 85 and 90% over a year.

Even with this relatively small surplus capacity, it might take time for demand to use it up. In several market areas, the outlook for TDI seems poor. The basic weak spots are exports and durable goods, compounded by competition from other isocyanates.

Export problems are similar to those of many other organic chemicals—higher U.S. production costs and competition for sales by foreign producers either in their own countries or in other consuming countries. Exports probably will tend to decline, influenced by the world economy. The result will be more TDI produced in the U.S. that will have to be absorbed by the U.S. market.

The durable goods market problem downstream for polyurethanes and, in turn, for TDI stems directly from the energy crisis of the past decade. In the auto industry, fewer, smaller cars have cut deeply into polyurethane demand. At first, polyurethanes—often in composites containing TDI, methylene diisocyanate (MDI), and polymeric MDI—seemed to penetrate more seating and other uses and hence to continue to grow in demand. But as the down-sizing in autos increased, less total polyurethanes were being used per car. Most forecasters hold that any fresh gains in use of polyurethanes per car will be small for the next few years, especially if economics force changes in models to be made less often.

Furniture is still the dominant use of flexible polyurethane foams, where most TDI goes. The share of flexible foam in furniture has slipped as recent recessions have reduced demand, especially demand related to purchases of houses. Again, prospects for much of a new demand increase seem some time off.

Even if these uses do increase, TDI may lose out slowly to its competitor, MDI. In both monomeric and polymeric forms, MDI production has been growing faster than has TDI. The reason is lower cost. Consumers of polyurethanes have found that MDI can be used to make foam which has properties as acceptable as a TDI-based foam and at a lower cost.

Longer-term growth rates for TDI may settle at 2 to 3% annually, whereas rates for MDI might be 7 to 10% annually. The result probably will be a continuation of the long pause in new TDI plants.

Japan proposes reducing its ethylene capacity

To make its petrochemical industry more competitive, Japanese ministry wants to establish joint management of reduced ethylene capacity

In Japan, they are called "structurally depressed industries." These industries have been trying to regain some of the international competitiveness—and respectable profits—that they have been losing ever since the world's first oil crisis of 1973–74 saddled them with high energy and raw material costs.

Some of them haven't made it yet. Japan's petrochemical industry is one of them.

Now, the powerful Ministry of International Trade & Industry (MITI) has come up with a scheme that it hopes will give the petrochemical industry a little more competitive muscle. Its recommendation: Reduce Japan's ethylene capacity a substantial 30% and establish a joint-management concept for the surviving ethylene units.

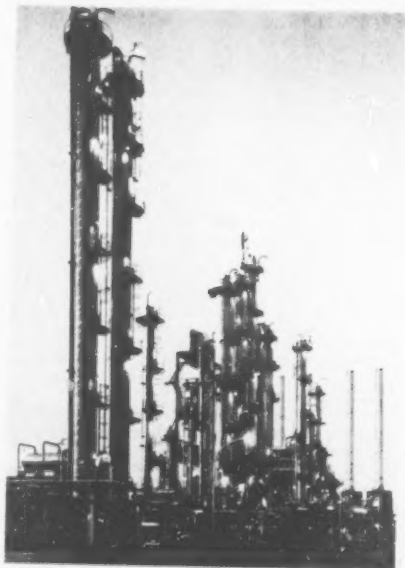
Not all of Japan's petrochemical industry leaders subscribe to MITI's joint-management idea. But none can argue with the reasoning that led to the recommendations from the ministry.

Buffeted by weak demand in Japanese markets, a flood of imported ethylene derivatives, and declining export opportunities, Japan's ethylene producers have been taking a beating.

Japan's nameplate ethylene capacity is about 6.2 million metric tons per year. By closing some plants, either permanently or temporarily, the industry has brought this capacity down to 5.4 million metric tons.

Still, this hasn't been enough. Ethylene output peaked in Japan in 1979, when production hit almost 4.8 million metric tons. In 1980, it dropped to 4.2 million metric tons and, last year, it slipped further to 3.6 million metric tons.

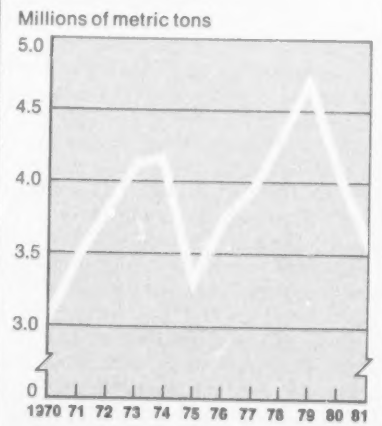
Results for the first quarter of 1982 offer little encouragement. Ethylene output during the first three months was only 860,000 metric tons. That's just 3.4 million metric tons on an annual basis.



Sumitomo Chemical's ethylene plant at Chiba could be a merger candidate

The ethylene industry's plant operating rates have plummeted from 78.7% of capacity in 1979 to 56.9% early this year. Even if the hoped-for upturn in the Japanese economy materializes later this year, it won't do much to improve matters for ethylene producers.

Japanese ethylene output hits six-year low



Source: Ministry of International Trade & Industry

MITI believes that Japanese producers will continue to face increasing import pressures throughout the eighties. It sees Japan's ethylene output bouncing back to no more than 3.8 million metric tons by 1985 and leveling off at about 4 million metric tons through 1990.

As a result, MITI wants to see the country's ethylene capacity cut to about 4.5 million metric tons per year. It suggests scrapping the older, smaller, inefficient naphtha crackers first.

There are plenty of candidates. The average age of Japan's ethylene units is almost 12 years. More than half of them have a capacity of 200,000 metric tons per year or less. More than one third of them have capacities of less than 100,000 metric tons.

Some of these units already have been shuttered, but there's still a long way to go to reach MITI's 4.5 million ton target.

Under the MITI proposal, the 15 petrochemical centers at which ethylene is produced would be reduced to six or seven. At several of the sites, two or more companies would be expected to consolidate their operations.

Although most industry leaders agree that something has to be done, not all of them think that the something has to be so drastic as MITI's proposed joint-management concept. Some feel that a cooperative marketing system would be a better way to go.

Others favor extending the Law on Extraordinary Measures for Specific Depressed Industries. This law, popularly known as the Structural Recession Law, expires in June 1983. Designed to help troubled basic industries such as aluminum, pulp and paper, and petrochemicals, it permits industries to cut capacity and rationalize output without worrying about the Antimonopoly Act.

MITI is studying the possibility of extending the Structural Recession Law or replacing it with a new one. It also is considering other alternatives to help the petrochemical industry. But a much lower ethylene capacity is the cornerstone of any plan for the industry's survival.

Earl Anderson, New York